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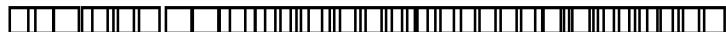
(54) **PRODUCTION OF RESIN HAVING HIGH WATER ABSORPTION PROPERTY**

(57)Abstract:

PURPOSE: To provide the production method of a resin having high water absorption property, capable of efficiently producing a water absorbing resin having high water absorption rate or highly water absorbing ability.

CONSTITUTION: Base polymer particles having water absorbing property are granulated into granules having prescribed particle diameters while being fluidized with an air flow and being sprayed with a binder and a cross-linking agent and the surface of the granules is cross-linked to produce a resin having high water absorption property.

* NOTICES *



1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] The manufacture approach of the water-absorbing resin characterized by making the front face of this granulation object while making a base polymer particle with absorptivity fluidize by the air current, and construct a bridge, spraying a binder and a cross linking agent on this base polymer particle while corning this base polymer particle in the granulation object of predetermined particle size.

[Claim 2] The manufacture approach of the water-absorbing resin according to claim 1 characterized by performing the above-mentioned granulation using fluidized bed granulator.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001] [Industrial Application] About the manufacture approach of a water-absorbing resin, in detail, this invention makes the start sanitary goods, such as sanitary items and a disposable diaper, and relates to the manufacture approach of the water-absorbing resin which can be used for the application for which maintenance of the liquid which absorbed water is needed in broad fields, such as medical supplies and a soil water retention agent.

[0002] [Description of the Prior Art] Conventionally, absorptivity resin is used for broad fields including sanitary goods, such as a sanitary napkin and a disposable disposable diaper. Although a large water absorption scale factor, a large water absorption rate, dipping nature, and large gel strength are demanded especially in order to avoid the problem which gives displeasure, such as urine leakage, when using absorptivity resin for sanitary goods, it is very difficult to satisfy these properties to coincidence.

[0003] For example, as a means which raises a water absorption rate, the approach of making particle size of absorptivity resin small, the approach of raising the crosslinking density of the front face of absorptivity resin, the approach of enlarging surface area of absorptivity resin, etc. are mentioned. However, when particle size is generally made small, since absorptivity resin tends to produce an "insoluble" phenomenon and gel blocking by contacting urine, a water absorption rate falls. Moreover, the approach of raising the crosslinking density of the front face of above-mentioned absorptivity resin is proposed as a technique which raises a water absorption rate, without reducing a water absorption scale factor (scale factor of the water absorption weight to absorptivity resin weight). However, since many of absorptivity resin manufactured by this technique contains many fines, suspension of impalpable powder arises and it has a bad influence on work environment. Moreover, it is easy to produce an insoluble phenomenon in the case of water absorption, and has problems, such as causing the fall of absorptivity ability. Although removal by the classification of impalpable powder can be considered as the solution approach of this problem, since it is uneconomical, it is not desirable.

[0004] On the other hand, a granulation is mentioned as an approach of enlarging surface area of absorptivity resin. The approach about the granulation of absorptivity resin is indicated by JP,4-3411,B and JP,4-3412,B. The approach indicated by this official report is the approach of carrying out homogeneity mixing of absorptivity resin and the aqueous liquid, and carrying out crushing granulation of the obtained mixture using special mixers, such as a high-speed moving-vane mold mixer or an air mixer. However, although improved, in order that the handling as fine particles may produce ***** and an insoluble phenomenon to the original small particle before a granulation object corning and may cause gel blocking further in the case of water absorption, as for the granulation object obtained by the above-mentioned approach, it has the problem that absorptivity ability falls.

[0005] Moreover, the approach about the granulation of absorptivity resin is indicated by JP,2-227435,A. The approach indicated by this official report leads the absorbent base polymer in which it has 30ml [g] or more ordinary pressure liquid absorption ability, and 40 % of the weight or more has particle size distribution 150 micrometers or less, excluding a bigger particle than 300 micrometers to a mixed zone, contacts the front face of a base polymer to a cross linking agent water solution and homogeneity, and corns the absorbent polymer constituent which carries out high-speed mixing of these, and has the rate of absorption for 20 or less seconds. By the above-mentioned corning method, 1 - 20% of the weight of the cross linking agent water solution is used to the absorbent base polymer, and each absorbent base polymer is corned according to an operation of the water in this water solution. However, in the above-mentioned corning method, only with ** which is not using the binder, and the above-mentioned water, a granulation becomes inadequate and various problems arise. Finally, the mechanical strength of the granulation object obtained is weak, for example, since the particle over which the bridge was corned and constructed is destroyed by the granulating machine during granulation, and expression of the part non-constructed a bridge takes place or it is easy to disassemble a granulation object into the primary particle of a basis at the time of water absorption, water absorption physical properties have the problem that it is not what should not necessarily be satisfied.

[0006] Therefore, the purpose of this invention is to offer the manufacture approach of the water-absorbing resin which can manufacture efficiently absorptivity resin with a high-speed water absorption rate and/or the high water-absorption-power force.

[0007] [Means for Solving the Problem] Having made the base polymer particle fluidize and spraying a binder and a cross linking agent on this base polymer particle, as a result of repeating research wholeheartedly, in order to develop the manufacture approach of absorptivity resin, this invention persons came to complete header this invention for the ability of the above-mentioned purpose to be attained by making the front face of a granulation object construct a bridge while corning.

[0008] That is, spraying a binder and a cross linking agent on this base polymer particle, this invention offers [while making a base polymer particle with absorptivity fluidize by the air current, and] the manufacture approach of the water-absorbing resin characterized by making the front face of this granulation object construct a bridge while corning this base polymer particle in the granulation object of predetermined particle size.

[0009] Hereafter, the manufacture approach of the water-absorbing resin of this invention is explained to a detail. The particle which consists of a well-known polymer which absorbs water, swells a lot of water in underwater as a base polymer particle which can be used in this invention, and forms a hydrogel can be mentioned preferably. As this polymer, the polymer which has a carboxyl group is desirable, for example, the hydrolyzate of the hydrolyzate of a starch-acrylonitrile graft copolymer, the neutralization (part) object of a starch-acrylic ester copolymer, the saponification object of a vinyl acetate-acrylic ester copolymer, an acrylonitrile copolymer, or an acrylamide copolymer, a polyvinyl alcohol denaturation object, partial neutralization polyacrylate, an isobutylene-maleic-anhydride copolymer, etc. are mentioned, and it can use as independent or two or more sorts of mixture on the occasion of use.

[0010] Moreover, although the above-mentioned base polymer particle may have the structure of cross linkage by the cross linking agent, its polymer which does not have the structure of cross linkage by the cross linking agent preferably is desirable. If the crosslinking density of a polymer is large, although a granulation is made, its mechanical strength of a granulation object is weak, and since it rose-**-comes to be separately easy by contacting water and urine, it is not desirable.

[0011] The above-mentioned base polymer particle can be obtained by various well-known polymerization methods. For example, although it is manufactured through a grinding process after compounding a polymer by approaches, such as an opposition suspension polymerization, an opposition emulsion polymerization, and aqueous polymerization, and being manufactured by drying this as it is or drying, the manufacture approach of the above-mentioned base polymer particle is not limited to these approaches.

[0012] moreover, although especially the particle size of the above-mentioned base polymer particle is not limited, particle size is 150 micrometers or less preferably, and a particle with a particle size of 70 micrometers or less is 60% of the weight or more of the whole still more preferably -- etc. -- it is desirable to have a fine particle size. If the above-mentioned particle size exceeds 150 micrometers, since surface area is small, while being hard coming to corn, since a granulation object becomes easy to collapse, and surface area is still smaller and it is hard to obtain a high water absorption rate, it is not desirable [there are few contacts of a base polymer comrade, and].

[0013] Although the mixed liquor of water, and a hydrophilic organic solvent and water, a water soluble polymer, etc. are mentioned, since the mechanical strength of the granulation object obtained especially increases as a binder which can be used in this invention, for example, the water soluble polymer solution made to dissolve a water soluble polymer in water or said mixed liquor is mentioned preferably. The concentration of the above-mentioned water soluble polymer in the above-mentioned water soluble polymer solution has 10 or less desirable % of the weight. If the concentration of a water soluble polymer exceeds 10 % of the weight, since the viscosity of a binder will become high and adjustment and spraying of a binder will become difficult, it is not desirable.

[0014] As the above-mentioned hydrophilic organic solvent, the mono-ether of low-grade glycols, such as lower alcohol, such as a methanol, ethanol, and propanol, ethylene glycol, and propylene glycol, a low-grade glycol, and lower alcohol, a glycerol, an acetone, etc. are mentioned.

[0015] As the above-mentioned water soluble polymer, polyacrylic acid, a polyacrylic acid metal salt, a carboxymethyl cellulose, hydroxyethyl cellulose, a polyethylene glycol, polyvinyl alcohol, etc. are mentioned.

[0016] In this invention, although especially the amount of the above-mentioned binder used is not limited, as the above-mentioned binder, the amount of the water used in the case of using water, the above-mentioned mixed liquor, or the above-mentioned water soluble polymer solution is the 20 - 500 weight section preferably to the base polymer particle 100 weight section, and is the 40 - 200 weight section more preferably. A granulation is inadequate in the amount used being under 20 weight sections, and if it may remain so much and the 500 weight

sections are exceeded, without coming a base polymer, for a **** reason, it is not desirable in time amount great to desiccation.

[0017] Moreover, as a binder, the addition of the above-mentioned water soluble polymer in the case of using the above-mentioned water soluble polymer or the above-mentioned water soluble polymer solution has desirable 0.001 - 10 weight section to the base polymer particle 100 weight section, and is 0.005 - 5 weight section more preferably. If there is less amount used than the 0.001 weight section, a granulation is inadequate, and it is not desirable in order that a water soluble polymer may check absorptivity ability, if it may remain so much and 10 weight sections are exceeded, without coming a base polymer particle.

[0018] It is not restricted, for example, the following compound etc. is mentioned, and especially the cross linking agent that can be used in this invention can choose and use the cross linking agent which does not react to mutual [one sort or two sorts or more of] from the group which consists of the following compound.

[0019] Ethylene glycol, a diethylene glycol, triethylene glycol, (Pori) Tetraethylene glycol, a glycerol (Pori), propylene glycol, Diethanolamine, triethanolamine, polyoxypropylene, Polyhydric alcohol, such as an oxyethylene-oxypropylene block copolymer, a pentaerythritol, and a sorbitol; (Pori) Ethylene glycol diglycidyl ether, Glycerol poly glycidyl ether, diglycerol poly glycidyl ether, (Pori) Sorbitol polyglycidyl ether, pentaerythritol poly glycidyl ether, Poly glycidyl ether compounds, such as propylene glycol diglycidyl ether and polypropylene glycol diglycidyl ether; 2 and 2-screw hydroxymethyl butanol-tris [3-(1-aziridiny) propionate], Halo epoxy compounds, such as poly aziridine compound; epichlorohydrin, alpha-methyl full OROHI drine compounds, etc., such as 1 and 6-hexamethylene diethylene urea and the diphenylmethane-screw -4, 4'-N, and N'-diethylene urea; Ethylenediamine, diethylenediamine, The poly isocyanate compounds, such as polyamine compound; 2, such as a TORIECHIREN tetra-amine, a tetra-ethylene PENTA amine, a pentaethylene hexa amine, and polyethyleneimine, 4-toluylene di-isocyanate, and hexamethylene di-isocyanate; Zinc, calcium, The mineral salt or organic metal salt which produces multicharged ion, such as magnesium and aluminum.

[0020] Moreover, also in the above-mentioned compound, especially the compound that has two functional groups is desirable, and one or more sorts of compounds chosen from the group which especially specifically consists of a diethylene glycol, triethylene glycol, a polyethylene glycol, a glycerol, polyglycerin, propylene glycol, diethanolamine, triethanolamine, polyoxypropylene, an oxyethylene-oxypropylene block copolymer, a pentaerythritol, and a sorbitol are used preferably.

[0021] The amount of the above-mentioned cross linking agent used has desirable 0.01 - 30 weight section to the base polymer 100 weight section, and its 0.1 - 10 weight section is more desirable. If the crosslinking density of the granulation object obtained as the amount of cross linking agents is under the 0.01 weight section becomes small, a water absorption rate falls by gel blocking and the amount of cross linking agents exceeds 30 weight sections, since crosslinking density becomes high too much and a water absorption rate and a coefficient of water absorption fall, it is not desirable.

[0022] And it can set at the time of use of the above-mentioned cross linking agent, and can use as a solution dissolved or diluted to solvents, such as water. As for the concentration of the

above-mentioned cross linking agent in this solution, it is desirable to consider as 1 - 30% of the weight of the range. In addition, when water is used as the above-mentioned solvent, this water acts also as a binder.

[0023] It **, and spraying the above-mentioned binder and the above-mentioned cross linking agent on this base polymer particle, the manufacture approach of the water-absorbing resin of this invention is characterized [while making the above-mentioned base polymer particle fluidize by the air current, and] by making the front face of this granulation object construct a bridge while it corns this base polymer particle in the granulation object of predetermined particle size.

[0024] Fluidization by the air current of the above-mentioned base polymer particle can be suitably performed by the well-known approach. The approach of performing using the fluid bed equipment which is equipment which a gas is fed [equipment] for the particle in a cylinder through a straightening vane from the lower part of a packed bed, and makes a particle group specifically flow is mentioned. Here, fluidization shows the condition that the particulate matter was pressured upwards by the air current and has suspended in a gaseous phase. Moreover, the gas used as an air current is a well-known gas, for example, air, nitrogen, etc. are mentioned.

[0025] Moreover, since spraying of the above-mentioned binder and the above-mentioned cross linking agent can be performed by the well-known approach, for example, a rotation disc method, the pressure nozzle method, 2 fluid nozzle process, etc., can adjust the diameter of a drop especially easily, can atomize a hyperviscous binder and can moreover atomize it with low voltage, it is desirable to carry out by 2 fluid nozzle process. Moreover, the above-mentioned binder and a cross linking agent may be sprayed according to an individual, may carry out homogeneity mixing and may be sprayed together.

[0026] It is desirable to perform above-mentioned fluidization and above-mentioned spraying within the same equipment, and it can use fluidized bed granulator, rolling fluidized bed granulator, etc. as this equipment, for example. The above-mentioned fluidized bed granulator can mean the equipment which attaches the nozzle which makes fluid bed equipment atomize a binder, and the particulate matter currently fluidized is made to corn by contacting the spraying drop of a binder, for example, "WSG/WSG [Powrex Make]", the "powder coating machine GPCG" [Powrex Make], "glow MAKKUSU" [the Fuji Paudal make], etc. can be mentioned. The above-mentioned rolling fluidized bed granulator is equipment which included the function of centrifugal rolling granulation and a stirring granulation in fluidized bed granulator, for example, "a multiplexer [Powrex Make]", a "new quince riser" [the Fuji Paudal make], etc. can be mentioned.

[0027] It is performed by above-mentioned fluidization and above-mentioned spraying, two or more above-mentioned base polymer particles gather according to an operation of a binder, and the granulation of the above-mentioned base polymer particle serves as a granulation object. Under the present circumstances, a bridge is constructed over the front face of the above-mentioned granulation object by this granulation and coincidence. In addition, the above-mentioned bridge formation may not be limited only to the front face of the above-mentioned granulation object, for example, the bridge may be constructed over each front face of the above-mentioned base polymer particle etc. Although the temperature and time amount in the case of

above-mentioned granulation and bridge formation can be suitably chosen according to the class of the base polymer and binder to be used, and cross linking agent, the range of them is usually 25-250 degrees C, and the range of them is 40-90 degrees C more preferably. Moreover, 10 - 120 minutes of time amount are desirable.

[0028] It is the aggregate of a particle with which two or more above-mentioned base polymer particles gathered, and were formed, and a bridge is constructed over the front face of the above-mentioned granulation object, and the granulation object which are obtained by carrying out like **** has predetermined particle size, and it can carry out drying this remaining as it is or if needed etc., and it can be used for it as a water-absorbing resin. The 70-1500 micrometers of the above-mentioned predetermined particle size are 100-1000 micrometers more preferably. Since it will be easy to receive constraint by particle size when using for various applications if it is it easy to produce an insoluble phenomenon to be less than 70 micrometers and exceeds 1500 micrometers, it is not desirable.

[0029] and excel in water absorption physical properties, and the parallel swelling coefficient of water absorption according [for example,] to the measuring method of the following ** - ** is desirable, 30-70 (g/g), and an initial water absorption rate are desirable, 5-15 (ml/30sec), and a dipping rate are desirable, and the above-mentioned water-absorbing resins obtained by the manufacture approach of this invention are 20-150 (ml/min) -- etc. -- it has the outstanding property.

[0030] ** [Measuring method of an equilibrium swelling coefficient of water absorption]

Polymer 1g is distributed in a 200g physiological saline (0.9% brine). After making this polymer swell until the coefficient of water absorption will be in equilibrium, the mixed liquor of a polymer and a physiological saline is filtered at the wire gauze of 80 meshes. The weight (W) of the obtained swelling polymer was measured and the value acquired by ** (ing) this value by the polymer weight (W0) before absorbing water, i.e., the value of W/W_0 , was made into the equilibrium swelling coefficient of water absorption (g/g).

[0031] ** [Measuring method of an initial water absorption rate]

Equipment Demand Wettability Tester shown in drawing 1 generally known as equipment which measures an initial water absorption rate It uses. the polymer spraying base (70mmphi --) set to water levels [oil level / of a physiological saline W] as shown in drawing 1 The coefficient of water absorption at the time of sprinkling 0.3g of polymers P and sprinkling a polymer on the base which put No.2 filter paper on glass filter No.1, is set to 0, and it is a coefficient of water absorption of 30 seconds after (this coefficient of water absorption). it measures with the graduation of the buret in which the amount of falls of the water level of a physiological saline W is shown -- having -- it measured and the initial water absorption rate (ml/30sec) was found.

[0032] ** [Measuring method of a dipping rate]

The equipment 10 (the bore of 25.6mm, glass cylinder filter with a cock with a die length of about 500mm (cylinder part)) shown in drawing 2 is filled up with polymer 0.5g. Make a polymer swell using a superfluous physiological saline, double an oil level with the place of 200ml from the lower part, and a cock is rebuked. Confirm that the swollen polymer P fully

sedimented like illustration, and a cock is opened. The physiological saline W measured the time amount which passes through between (50ml of volume) the two marked lines L (it is a 150ml point from the lower part), and M (it is a 100ml point from the lower part) shown in drawing, ******(ed) the volume between the marked lines (ml) by the measuring time (min), and considered as the dipping rate (ml/min).

[0033] [Example] Hereafter, although an example and the example of a comparison explain this invention to a detail, this invention is not limited to these.

[0034] In addition, the measuring method performed in the example and the example of a comparison is as the above-mentioned ******-****** and the following ******.

****** [Particle size distribution and measuring method of mean particle diameter]

Polymer 100g was classified using the JIS sieve, and it asked for particle size distribution and mean particle diameter from the weight fraction of each fraction.

[0035] [the example 1 of manufacture] -- 5l. 4 opening round bottom flask which attached an agitator, a reflux cooling pipe, and nitrogen installation tubing -- cyclohexane 1600ml and sorbitan monostearate -- [-- "-- LEO gold SP-S10" and the Kao Corp. make -- after having taught]5g, making it distribute and performing a nitrogen purge, the temperature up was carried out to 75 degrees C. Moreover, 560g of 30% of the weight of caustic soda water solutions neutralized 510g of 80% of the weight of acrylic-acid water solutions in another container, 0.4g of potassium persulfate was added to it with 30g of ion exchange water as an initiator, and the polymerization nature water solution was adjusted to it. And after dropping this polymerization nature water solution over 1.5hr(s) into the above-mentioned 4 opening round bottom flask and carrying out a polymerization under stirring, it held at the temperature of 70-75 degrees C for 0.5 hours, and the polymerization was made to complete. As a result of drying the obtained sodium-polyacrylate polymer particle and measuring particle size distribution and mean particle diameter, the particle with a particle size of 70 micrometers or less was 85% of the weight of a microparticulate sodium-polyacrylate particle. Moreover, the moisture in this microparticulate sodium-polyacrylate particle was 0.6 % of the weight. About the obtained microparticulate sodium-polyacrylate particle (base polymer particle), the equilibrium swelling coefficient of water absorption, the initial water absorption rate, and the dipping rate were measured. The result is shown in [Table 1].

[0036] [Example 1] The particle with a particle size of 70 micrometers or less obtained by the approach of the example 1 of manufacture made 1000g of 85% of the weight of microparticulate sodium-polyacrylate particles the base polymer particle, and a flow of microparticulate sodium polyacrylate was started by feeding 80-degree C air in equipment for the fluidized bed granulator of 10l. capacity. Next, it sprayed into the system, having applied what mixed "DENAKORU EX810" [product made from Nagase Brothers Chemicals Industry] 10.0g with 500g of water as a cross linking agent as a binder for about 30 minutes. Subsequently, carried out the temperature up of the temperature of feeding air to 85 degrees C, it was made to dry for 30 minutes, and the granulation object was obtained. Using shaking ********, like ********, it carried out, particle size distribution and mean particle diameter were measured, and the equilibrium swelling coefficient of water absorption, the initial water absorption rate, and the dipping rate were further measured

about the obtained granulation object. The result is shown in [Table 1]. The end of a particle or a big and rough particle is not almost in the obtained granulation object, and it turns out that the manufacture approach of this invention is an approach excellent in granulation nature so that clearly from the result shown in [Table 1].

[0037] [Example 2] The particle with a particle size of 70 micrometers or less obtained by the approach of the example 1 of manufacture made 1000g of 85% of the weight of microparticulate sodium-polyacrylate particles the base polymer particle, and a flow of a microparticulate sodium-polyacrylate particle was started by feeding 80-degree C air in equipment for the fluidized bed granulator of 10l. capacity. Next, it sprayed separately into the system as a binder, having applied [500g of 0.03 % of the weight sodium-polyacrylate water solutions, and / which dissolved "DENAKORU EX810" [product made from Nagase Brothers Chemicals Industry] 5.0g in 10g of ion exchange water as a cross linking agent] them for 30 minutes. Subsequently, carried out the temperature up of the temperature of feeding air to 85 degrees C, it was made to dry for 30 minutes, and the granulation object was obtained. About the obtained granulation object, the same measurement as an example 1 was performed. The result is shown in [Table 1]. The end of a particle or a big and rough particle is not almost in the obtained granulation object, and it turns out that the manufacture approach of this invention is an approach excellent in granulation nature so that clearly from the result shown in [Table 1].

[0038] [Example 3] While the particle with a particle size of 70 micrometers or less obtained by the approach of the example 1 of manufacture fed 80-degree C air in equipment for the "multiplexer" of 10l. capacity [Powrex Make] by making 500g of 85% of the weight of microparticulate sodium-polyacrylate particles into a base polymer, stirring by the impeller was performed, and a flow and stirring mixing of the above-mentioned microparticulate sodium-polyacrylate particle were started. Next, it was begun into the system to spray 0.6g sodium polyacrylate and the solution which melted "DENAKORU EX810" [product made from Nagase Brothers Chemicals Industry] 5.0g to 1000g ion exchange water as a cross linking agent, and spraying of a binder was ended in about 40 minutes. Then, it dried with 85-degree C air for 30 minutes, subsequently it cooled, and the granulation object was obtained. About the obtained granulation object, the same measurement as an example 1 was performed. The result is shown in [Table 1]. The end of a particle or a big and rough particle is not almost in the obtained granulation object, and it turns out that the manufacture approach of this invention is an approach excellent in granulation nature so that clearly from the result shown in [Table 1].

[0039] [Example 1 of a comparison] The granulation object was obtained like the example 1 except not using a cross linking agent. And the same measurement as an example 1 was performed about the obtained granulation object. The result is shown in [Table 1]. The absorptivity ability of the obtained granulation object was low so that clearly from the result shown in [Table 1].

[0040]

[Table 1]

| | | ベースポリマー粒子 | 実 施 例 | | | 比較例 1 |
|--------------------------------|------------|-----------|--------|--------|--------|--------|
| | | | 1 | 2 | 3 | |
| 平衡膨潤吸水量 (g/g) | | 4 0 | 3 5 | 4 0 | 4 1 | 3 8 |
| 初期吸水速度 (ml/30sec) | | 3. 2 | 5. 9 | 6. 1 | 6. 7 | 3. 4 |
| 通 液 速 度 (ml/min) | | 5. 2 | 2 6. 6 | 3 7. 4 | 9 6. 5 | 5. 3 |
| 粒 径 分 布 (μ m) | <70 | 8 5. 0 | 2. 5 | 1. 5 | 3. 1 | 4. 9 |
| | 70 ~ 106 | 1 4. 8 | 5. 8 | 5. 4 | 8. 5 | 7. 7 |
| | 106 ~ 150 | 0. 2 | 9. 1 | 1 2. 3 | 1 6. 2 | 1 8. 1 |
| | 150 ~ 355 | 0 | 3 6. 9 | 2 8. 8 | 4 2. 6 | 3 5. 1 |
| | 355 ~ 590 | 0 | 2 3. 4 | 2 9. 4 | 2 1. 8 | 2 7. 2 |
| | 590 ~ 1000 | 0 | 2 0. 8 | 2 1. 1 | 6. 8 | 5. 0 |
| | 1000~1500 | 0 | 1. 3 | 1. 2 | 0. 8 | 1. 4 |
| | 1500< | 0 | 0. 2 | 0. 3 | 0. 2 | 0. 6 |

[0041] [Effect of the Invention] The manufacture approach of the water-absorbing resin which can manufacture efficiently absorptivity resin with a high-speed water absorption rate or the high water-absorption-power force according to this invention is offered, and since the base polymer particle which has absorptivity in a detail, without applying compressive force and shearing force is corned and it is possible to obtain the granulation object of the porosity-ized indeterminate form, i.e., absorptivity resin with large surface area, the water-absorbing resin which improved the water absorption rate and the dipping rate greatly is obtained. Furthermore, it is possible to achieve simplification of a process by advancing a granulation and bridge formation to coincidence, and since a bridge is constructed over a base polymer comrade and a granulation object does not collapse at the time of contact in water, either, the water-absorbing resin to which gel blocking does not take place is obtained. Therefore, the water-absorbing resin obtained by the manufacture approach of this invention can be used for broad fields including sanitary goods, such as a disposable diaper and a sanitary napkin.

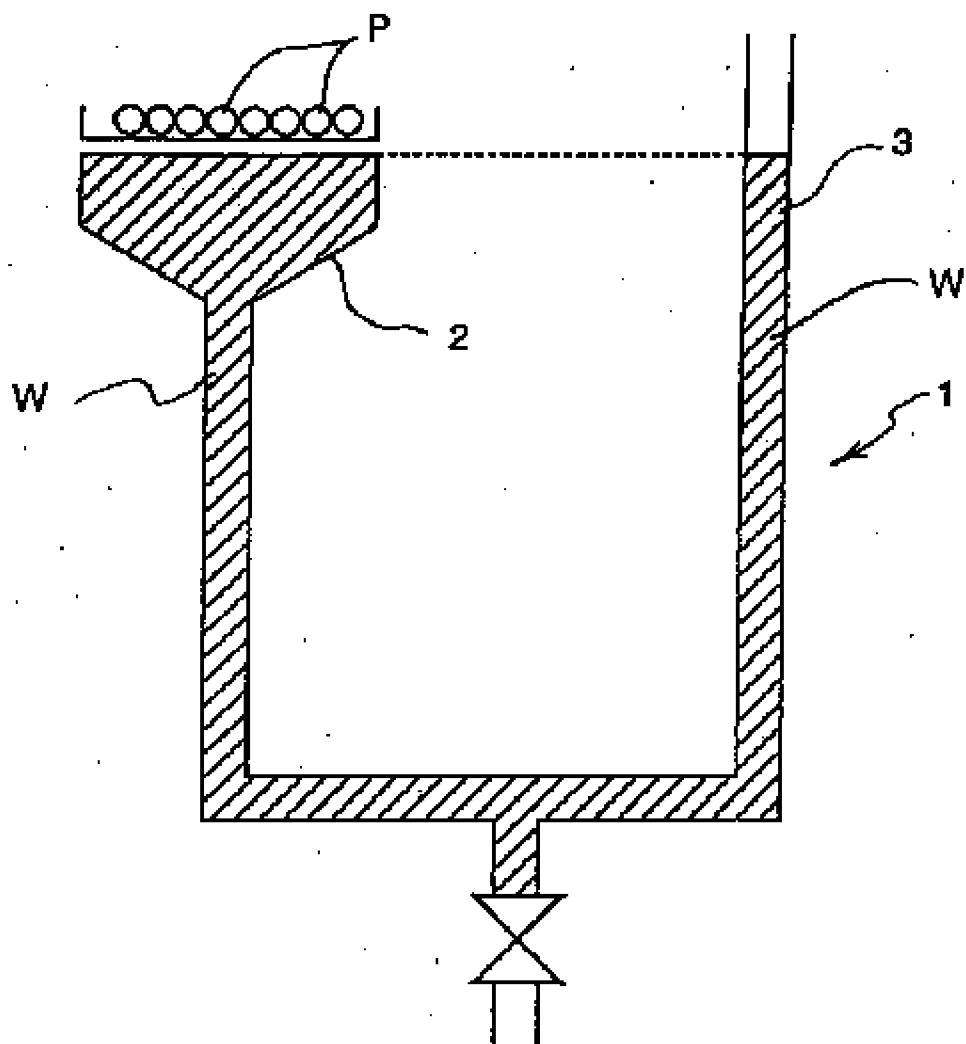


FIG 1

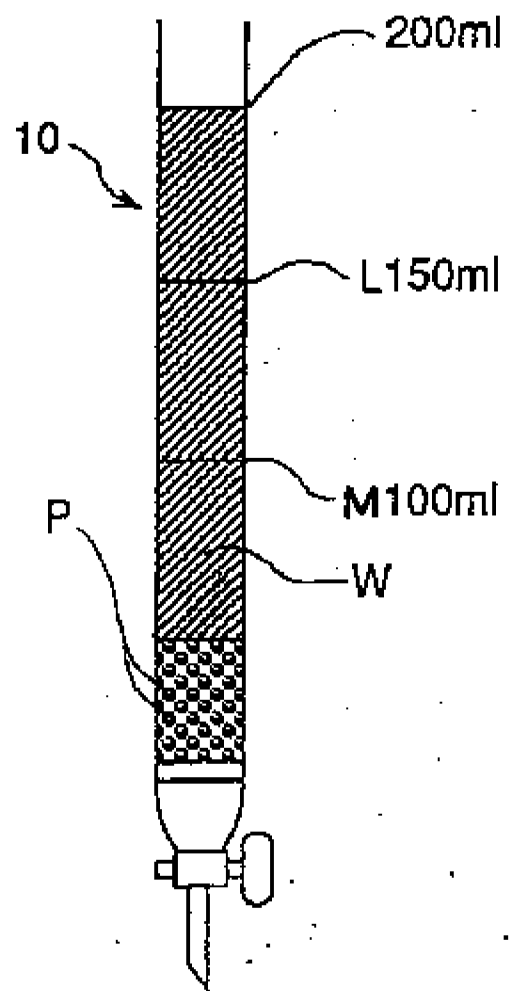


FIG 2